Letters to the Editor

The Board of Editors will not hold itself responsible for opinions expressed in the letters published in this section. The notes containing reports of new work communicated for this section should not contain many figures and should not exceed 500 words in length. The contributions must reach the Assistant Editor not later than the 15th of the second month preceding that of the issue in which the letter is to appear. No proof will be sent to the authors.

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ON NUCLEAR BINDING ENERGY

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A smooth curve, drawn over the plots of nuclear binding energy against mass number, is likely to be fitted in by a number of relationships with four or more variable parameters and corresponding adjustable constants. A theoretical significance given to the parameters, in any of these possible relationships, would not necessarily imply that the interpretation should be valid. This is all the more true when the experimental points lie scattered about the mean graph.

It is, therefore, more reasonable to be guided by the binding energy data, in an attempt to find a suitable relation for nuclear energy. It may be observed that in the usual Bethe-Weiszacker relation, the term denoting the binding energy per nucleon becomes inflated to a value of the order of -17 mev. per nucleon, in place of the maximum experimental value of -8.794 mev per nucleon, in the region near mass number 60, at mass number 62. This will be seen from the nuclear mass table of Everling *et al.* (1960). This inflation was necessary to counteract the effect of the other terms considered in the relation. It has been further noted that the binding energies for other mass numbers decrease on both sides of the region of maximum, in terms of the square of the mass number deviation, with only one adjustable constant associated with it. To make a closer fit with the large amount of binding energy data slight adjustments of the maximum binding energy and the corresponding mass number are helpful and we obtain.

$$E = -8.728A + a(A-63.5)^2 \text{ mev., where } a = 9.181\times10^{-3}$$

This is transformed to

$$E = (-9.893A + 37.0) + 9.181 \times 10^{-3}A, \text{ in mev. units.}$$

The first part in the transformed relation signifies the usual binding energy per nucleon. The second term is the disruption energy, increasing proportionally with the square of the mass number. The constant term in the first part signifies that the nuclear binding energy of this character would come into operation only with nuclei having larger mass number than 3.75 for which E is zero, i.e. from mass number 4.

The relationship obtains the binding energies of all the 1600 nuclei, from carbon ($Z = 6$) to Fermium ($Z = 100$), tabulated by Everling, *et al.* with an average fluctuation of less than ± 3 mev., for any mass number. A few nuclei which have larger deviation in binding energy from the mean value for a mass number, obtain deviations of the order of ± 10 mev. Magnitudes of deviations calculated by Bethe-Weiszacker relation (Dutta *et al.* 1962) are generally much larger.

It appears that the fluctuations also can be expressed in terms of suitable additional or modified terms which are necessarily functions of N and Z. This will be attempted in a more detail paper with co-workers.

RFERENCES

Everling, F., Konig, L. A. Mathauch, J. H. E., 1960, *Nuclear Physics*, **18**, 529.

Dutta, A. K., Pal, B., Das Gupta, A., Choudhury, N., 1962, *Indian Jour. Physics*, **36**, 497.